

ANNEX TO EXHIBIT B

TDP OPTION SELECTION WORKSHEET SYSTEM: Common Driver Trainer (CDT) Tactical Wheeled Vehicle (TWV) DATE PREPARED:			
A. CONTRACT NO.	B. EXHIBIT/ATTACHMENT NO.	C. CLIN	D. CDRL DATA ITEM NO(s).
1. TDP Level (X and complete as applicable.)			
A. <input type="checkbox"/> CONCEPTUAL LEVEL <input type="checkbox"/> DEVELOPMENTAL LEVEL <input checked="" type="checkbox"/> PRODUCTION LEVEL	B. REMARKS: (See Appendix A)		
2. TYPE AND FORMAT (X all that apply and complete as applicable.)			
A. <input checked="" type="checkbox"/> TYPE 2D: 2D DRAWINGS <input type="checkbox"/> TYPE 3D: 3D MODELS ONLY <input checked="" type="checkbox"/> TYPE 3D: 3D MODELS WITH ASSOCIATED 2D DRAWINGS (See Appendix A)	B. <input checked="" type="checkbox"/> NATIVE CAD (See Appendix A) _____ <input checked="" type="checkbox"/> ISO 10303 STEP FORMAT (See Appendix A) _____ <input checked="" type="checkbox"/> ISO 32000 PORTABLE DOCUMENT FORMAT _____ <input checked="" type="checkbox"/> OTHER ELECTRONIC FORMAT _____ AUTOCAD - .DWG <input type="checkbox"/> HARDCOPY _____ REMARKS : _____		
3. CAGE Code AND DOCUMENT NUMBERS		D. To Be Assigned By: PEO-STRI	
A. <input type="checkbox"/> CONTRACTOR CAGE AND DOCUMENT NUMBERS <input checked="" type="checkbox"/> GOVERNMENT CAGE (COMPLETE 3B & 3C OR 3D)	B. USE CAGE CODE: 57039		C. USE DOCUMENT NUMBERS:
4. DRAWING FORMATS (X one and complete as applicable)			
<input type="checkbox"/> CONTRACTOR FORMAT. <input checked="" type="checkbox"/> GOVERNMENT FORMAT. REMARKS: (See Appendix A).			
5. TDP ELEMENTS REQUIRED (X all that apply)			
ELEMENTS REQUIRED TO BE DETERMINED BY CONTRACTOR - OR THE FOLLOWING ARE REQUIRED: <input type="checkbox"/> CONCEPTUAL DRAWINGS/MODELS AND ASSOCIATED LISTS <input type="checkbox"/> DEVELOPMENTAL DESIGN DRAWINGS/MODELS AND ASSOCIATED LISTS <input checked="" type="checkbox"/> PRODUCT DRAWINGS/MODELS AND ASSOCIATED LISTS <input type="checkbox"/> COMMERCIAL DRAWINGS/MODELS AND ASSOCIATED LISTS <input type="checkbox"/> QUALITY ASSURANCE PROVISIONS <input type="checkbox"/> SPECIAL INSPECTION EQUIPMENT (SIE) DRAWINGS/MODELS AND ASSOCIATED LISTS <input type="checkbox"/> SPECIAL TOOLING (ST) DRAWINGS/MODELS AND ASSOCIATED LISTS <input checked="" type="checkbox"/> SPECIFICATIONS <input checked="" type="checkbox"/> SOFTWARE DOCUMENTATION <input type="checkbox"/> SPECIAL PACKAGING INSTRUCTIONS (SPI) DRAWINGS/MODELS AND ASSOCIATED LISTS			
6. ASSOCIATED LIST (X and complete as applicable)			
<input checked="" type="checkbox"/> A. PARTS LIST (X ONE)	<input checked="" type="checkbox"/> (1) INTEGRAL	<input checked="" type="checkbox"/> (2) SEPARATE (See Appendix A)	
<input type="checkbox"/> B. DATA LISTS (X ONE)	<input checked="" type="checkbox"/> (1) NOT REQUIRED	<input type="checkbox"/> (2) REQUIRED	
<input type="checkbox"/> C. INDEX LISTS (X ONE)	<input checked="" type="checkbox"/> (1) NOT REQUIRED	<input type="checkbox"/> (2) REQUIRED	
<input checked="" type="checkbox"/> D. WIRING LISTS (X ONE)	<input type="checkbox"/> (1) NOT REQUIRED	<input type="checkbox"/> (2) REQUIRED (See Appendix A)	
<input checked="" type="checkbox"/> E. INDENTURED DATA LISTS (X ONE)	<input type="checkbox"/> (1) NOT REQUIRED	<input checked="" type="checkbox"/> (2) REQUIRED (See Appendix A)	
<input checked="" type="checkbox"/> F. APPLICATION LISTS (X ONE)	<input type="checkbox"/> (1) NOT REQUIRED	<input checked="" type="checkbox"/> (2) REQUIRED (See Appendix A)	
7. APPLICABILITY OF STANDARDS. The following Standards apply: (X as applicable)			
<input checked="" type="checkbox"/> ASME Y14.100 ENGINEERING DRAWING PRACTICES WITH APPENDICES: <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D <input checked="" type="checkbox"/> E	<input checked="" type="checkbox"/> ASME Y14.24 TYPES AND APPLICATIONS OF ENGINEERING DRAWINGS (See Appendix A) <input checked="" type="checkbox"/> ASME Y14.34 ASSOCIATED LIST <input checked="" type="checkbox"/> ASME Y14.35M REVISION OF ENGINEERING DRAWINGS AND ASSOCIATED LIST <input checked="" type="checkbox"/> ASME Y14.41 DIGITAL PRODUCT DEFINITION DATA PRACTICES <input checked="" type="checkbox"/> ASME Y14.5 DIMENSIONING AND TOLERANCING	<input type="checkbox"/> OTHER STANDARDS APPLY AS DESCRIBED: COMPANY STANDARDS PERMITTED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
8. OTHER TAILORING (Attach additional sheets as necessary) The criteria for verifying compliance for each piece part and higher assembly shall be documented as either a note on a drawing, a separate procurement control drawing, or as part of section 4 of a specification. Reference to company unique standards is not allowed. See Appendix B for other tailoring.			

APPENDIX A

This Appendix provides supplemental information for the TDP Option Selection Worksheet.

Block 1.B.: All drawings shall be in the English language.

Block 2.A.: Two dimensional (2D) drawings shall be derived from three dimensional (3D) solid models using a Computer-Aided Design (CAD) system. Existing drawings that are compatible with requirements defined herein, or those that define Commercial-Off-The-Shelf items, may be electronically scanned and released without modification. The 2D drawing representations for arrangement drawings and installation sequence drawings may be electronically scanned and released into the IDE as Portable Document Format (PDF) files.

Block 2.B.: Electronic on-line access to digital data generated or retained by the current design activity data is required. The term “current design activity” is defined as “The design activity currently responsible for the design of an item. This may be the original design activity or a design activity to which the design responsibility has been transferred.”

Two and three dimensional product data including models, drawings, schematics, illustrations and Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and computer Aided Engineering (CAE) product data shall be delivered in both

The native 3-D CAD format (as determined by the prime contractor)

And also

A data definition format for neutral file exchange in accordance with Standard for the Exchange of Product Model Data (STEP), ISO 10303.

Two dimensional drawings, illustrations and schematics shall be delivered in accordance with STEP AP 201 (Explicit Draughting) or AP 202 (associative Draughting).

All two dimensional drawings, illustrations and schematics shall be delivered with complete and accurate indexing data. Indexing data are identifiers and attributes that allow the receiver of the images to associate each with complete documents, and to associate documents with one another and with the correct material item.

Access to the Prime Contractor developed Contractor Integrated Technical Information Service (CITIS); i.e., the Integrated Development Environment (IDE), shall be utilized for the capture and retention of digital data. Solid models and drawings shall be released to and retained in digital format in an IDE. Electronic drawing files, whether created by the prime contractor, a subcontractor, or a vendor, shall be entered into the IDE database in conjunction with the initial preparation.

Block 4: Drawing format templates residing in the Prime Contractors CAD database shall be used for creating 2D drawings. Autodesk AutoCAD drawing templates shall be

accessed via the IDE database and electronic copies shall be made available to subcontractors and vendors upon request.

Block 4 – Remarks: Types of drawings shall be IAW ASME Y14.24-1999 (including Appendix A of ASME Y14.24-1999) and Appendix B para B9.1 of ASME Y14.100-2000. COTS items shall be delivered as Source Control or Vendor Item Control drawings. Vendor Item Control Drawings shall provide two or more sources. If two or more sources cannot be identified, then the vendor specific data sheets shall be attached as part of the Vendor Item Control Drawing. The vendor specific data sheets shall provide sufficient engineering definition for acceptance of interchangeable items within specified limits. (See ASME Y14.24, paragraph 8.2.3)

Block 6.A.: Parts lists may be integral or separate. ASME Y14.34M-1996, Section 5, shall be used for the preparation of parts lists.

Block 6.D: Wiring lists shall be provided when assemblies require interconnection. ASME Y14.24M-1996, paragraph 10, shall be used to establish the requirements for the preparation of wiring lists.

Block 6.E: Data stored in IDE shall be utilized to create an indented data list for each simulator type and serialized top level end item.

Block 6.F: Complete application data shall be displayed on individual drawings. Drawings shall have an application block listing the drawing number of the next higher assembly in the “Next Assembly” column and the nomenclature or equivalent designator of the assembled unit(s), which the drawing applies in the “used on” column. When a part or assembly has multiple uses at the next level, the application block on the drawing may specify “multiple usage” or a comparable statement with a table to depict each use.

Block 7: ASME Y14.5-2009 shall apply. ASME Y14.100-2004, Appendix E, paragraph E6 and E7 shall apply to markings on drawings. For multiple sheet drawings, all sheets shall have the same revision level. The design activity shall select the types of drawings to be prepared using the following sections of ASME Y14.24-1999. As a minimum, these types of drawings shall be prepared based on contractor’s standard drawing practices.

ASME Y14.24-1999 Section/Title:

- | | |
|----|--|
| 3 | Detail Drawings (fully assembled product representation) |
| 4 | Assembly Drawings (sequence or end item representation) |
| 5 | Installation Drawings (assembly sequence representation) |
| 6 | Modifying Drawings |
| 7 | Arrangement Drawings (top level end item Product drawings) |
| 8 | Control Drawings |
| 9 | Interface Drawing |
| 11 | Mechanical Schematic Diagrams |
| 12 | Electrical/Electronic Diagrams |
| 13 | Special Application Drawings |

Appendix B

Digital Data Description Requirement

1. Digital Data Delivery (Sample): You shall submit four (4) representative samples of each digital data format to be submitted as early as possible. These samples will be used for verification of procedures and processing into a life cycle data repository. Each supplier shall also submit the required representative samples. The representative samples shall include data in the appropriate digital formats (native, neutral, and legacy data where applicable). The representative samples shall identify the computer system (including operating system with its version), computer software application used to archive the data and version used, respectively, of the system originating the data on the media label. The supplier shall also submit a digital sample of the Metadata Spreadsheet representative of the sample files delivered in the format described in paragraph 5 of this Appendix. See Table 1 for acceptable media.

Sample files shall be accompanied by a technical point of contact (POC) (name, phone number, FAX number, and e-mail address if available) stated in an ASCII text file, preferably on a DVD-ROM for sample data only. This will enable any problem which may be evident in the sample delivery to be resolved in a timely manner prior to final digital data delivery.

Sample files shall have one sheet per filename unless the sample data represents word processing files.

2. Digital Data Delivery (Final): Digital data shall be delivered, in accordance with the continuation sheet to the DD Form 1423 and as follows:

a. On digital drawing formats the sheet layout, border, title block, revision block, other contractually imposed format conditions, and other conventions of engineering drawing format including definition and use of explicit scaling factors shall be integral to the digital data file. Filenames for all digital data shall include the appropriate file extensions where practical or appropriate and shall be included in the metadata spreadsheet filename column. Engineering drawings shall be drawn using a CAD system and shall conform to the DD Form 1423.

b. All pertinent entities that comprise the final digital file should be viewable upon opening of the digital data files. If they cannot be viewable without the user being required to change layers or levels, then file layer or level conventions shall be identified for all data residing in the digital data file. The user should not have to search for layers which should be turned on or off in order to view the final drawing's entities.

c. File layer or level conventions which are used, shall be identified for all data residing in the digital data file.

d. Revisions made to the digital data base shall accurately and precisely represent the change in dimensions to the geometry of the object or assembly to ensure the shareability of the represented data.

e. Raster images, such as TIF, GIF, JPEG, and Bitmap shall not be imported or pasted into a CAD generated vector drawing format.

f. Files shall be stored in separate subdirectories by product definition data type (such as native document, neutral document, native drawings, etc) to enhance processing.

g. Delivery Media Requirements: Media requirements (physical and file copy format) of the following types are listed in order of preference for delivery of digital data. In order to take advantage of the latest in digital media technology, other media not listed shall be approved by the requiring office identified in block 6 of the DD Form 1423. See Table 1 for acceptable media and other pertinent information:

TABLE 1
ACCEPTABLE MEDIA FOR DELIVERABLES (Sample & Final)

Type	Acceptable Format	Max Length	Max Size	Density	Requirements**
DVD-ROM	DVD-R or DVD+R		4.7 Gigabyte		
Internet connection	ftp				20 MB or smaller per data set.
Internet connection	WEB accessible				

*. Paper labels shall not be used on DVD-ROMs

** Files delivered must be uncompressed unless also delivered with decompression software.

NOTES:

1. "ISO 9660" is the preferred option. Files and directories recorded to DVD based on the ISO 9660 standard must meet the following (8+3) requirements: A file name may not contain more than eight alphanumeric characters and the underscore symbol "_". A file name extension may not contain more than three alphanumeric characters. A directory name may not contain more than eight alphanumeric characters and the underscore symbol "_". The DVDs shall be recorded using mode one, level one, and single session media.

2. "Joliet" is an alternate acceptable format option. Joliet formatting allows for filename length greater than the (8+3) format. The maximum filename length shall not exceed 24, including periods or other special characters. [Joliet also records the associated MSDOS-standard name (8+3 characters) for each file so that the DVD may be read on MSDOS systems, Windows, or earlier versions of Windows.] The DVDs shall be recorded using mode one, single session media.

i. Physical media shall be labeled with the following information:

(1) Prime Contractor Name/CAGE

(2) Contract number

(3) System

(4) The physical media (DVD, disk, etc.) shall be numbered sequentially (i.e., "Disk 2 of 3"), regardless of the type of media.

(5) Range of document numbers included on the disk.

(6) For DVD's, list the archiving method used to create the DVD (ISO 9660/Joliet).

(7) The appropriate Distribution Statement and Export Control Notice shall be listed in accordance with the DD Form 1423.

j. README.TXT File: On each supplied DVD, the contractor shall supply a README.TXT file in ASCII text format. This file shall include:

(1) The name and version of the software utilized in creation of the native files included in the delivery.

(2) The type and number of files included in the delivery. For example, a statement similar to the following might be used:

Total Number of Files Delivered: 1200
Number of Native AutoCAD Files: 400
Number of STEP Files: 400

(The STEP files delivered are representative neutral files of the native AutoCAD files.)

(3) The name, phone number, and e-mail address of the contractor's technical data point of contact (a person familiar with processes used to create and archive data.)

(4) The operating system and version, and the command (i.e., UNIX tar) and command switches used to archive the delivered data.

(5) Explanation, as necessary, of field headings/data titles used in the metadata spreadsheet.

(6) Any other information pertinent to the data delivery and the usage of the software packages including the document, drawing, design, and associated files shall be stated. This includes special instructions for the proper setup of the CAD software package to import the native files.

(7) Each disk or DVD must be scanned for virus.

3. Legacy Data:

a. Drawings/Documents which were developed in a non-electronic format (i.e., manual drafting board or scanned) and have not been previously delivered to the government, shall be delivered in digital form in an industry standard format, such as TIFF (CCITT) Group 3 or 4, or using MIL-STD-1840C or later format.

NOTE: Some raster image viewers do not always recognize the correct polarity of a black and white TIFF image. Because of this fact, in order for the government to

receive the correct polarity files, some sample legacy files should be saved (by the contractor) both negative and positive polarity before delivery to the government in order to compare file sizes. The smaller file size (for black and white TIFF images) for each test file saved indicates a white background with black data information, which is the correct positive polarity needed by the government.

b. Electrical/Electronic Product Related Drawings produced on stable based drawing media (such as undimensioned, master pattern, etc) shall be digitized into a Gerber file format (RS-274 or Extended Gerber RS-274X) for purposes identified in the Machine Control Data section (paragraph 6d, Machine Control Data). The RS-274X format, if used, shall be in compliance with the current version of the 'Gerber RS-274X Format User's Guide' (Part # 414-100-014 Rev D or later revision) by Gerber Systems Corp and shall not contain data that would restrict its usage as a neutral file for laser photoplotters.

c. The resulting files shall be quality checked for compliance with the design requirements specified in the product definition data, which includes the stable based drawings. This will ensure that the integrity of the design is maintained after the digitization process. (If the capability to digitize does not exist, the undimensioned and master pattern drawings shall be delivered on stable based media (Mylar® per IPC-D-275)).

d. The Gerber images shall contain the following note (at a location where it will not interfere with the artwork layer images):

“THIS GERBER IMAGE WAS PRODUCED BY DIGITIZING AN IMAGE FROM STABLE BASED MEDIA.”

e. Stable based drawings of non-performance related information such as decals/labels may be exempt from the Gerber format requirement and an acceptable substitute (i.e., TIFF) may be used.

4. Product Definition Data: Product Definition Data is grouped in five basic categories. Definitions and delivery formats are as follows:

NOTE: To enhance manageability, transportability, and usability, applicable native and neutral design model files shall be efficiently grouped and encapsulated at each appropriate item level. The encapsulated model files shall include design data such as schematics, 3-D models, parts libraries, link files, configuration files, attribute files, and other associated files required to regenerate the complete design in any CAD environment that has the native or other suitable design software package. Also, the above requirement applies to machine control data (such as Gerber, drilling, etc) and software data files. MS-Windows based PKZIP (version 10.0 or subsequent to handle long filenames) or UNIX's TAR command is the preferred encapsulation method. If a preferred method is not used, an alternate method must be approved by the contracting officer before data delivery.

a. *Word Processor Documents:* Documents created on a word processor can be delivered and interpreted on the majority of word processing systems including those widely used in the DoD, such as Microsoft Word® (preferable), and Open Office Write. Software other than these require prior approval by the contracting officer. Test Methods and Procedures, Associated Lists, Acceptance Testing Criteria, Configuration

Item Specs, and Engineering Analysis results are examples of these documents. Illustrations and graphics shall not be delivered inside of a word processing, desktop publishing, or spreadsheet formatted document unless a single copy of the program(s) used to produce the embedded objects is (are) provided to the government as a part of the cost of providing a particular digital data package. Figures containing images such as a simple flow chart depicting a test set layout are acceptable, however illustrations/graphics shall be referenced within the document for traceability and shall be delivered along with the documents. Documents delivered shall have the page size set to be the standard 8-1/2 by 11 inch or equivalent "A" drawing size. **NOTE: Government CAGE code deliverables shall be delivered in Microsoft Word®.** Word processing documents shall have one filename to cover all sheets for each document number submitted.

Delivery Format: Native Document - MS-Word® or Open Office Write

AND

Neutral Format –Portable Document Format (PDF)

b. *Engineering Drawings (VECTOR):* Drawings shall be delivered that are made from presentations describing a particular physical/logical entity or process using 2-dimensional geometry and textual information for both electrical/electronic and mechanical items. These drawings may also be created from view plane projections of a 3-D model, but parametric-based systems may be used to facilitate semi-automatic creation of engineering drawings from the 3-D database. The requirements set forth in paragraph 4c, Mechanical Engineering Models, sub-paragraphs (1) through (3) of the Geometry Creation Requirements for 3-D Models shall apply. Drawings delivered that are cage code **57039** shall not contain any grouped text attributes and all entities shall be present on layer zero.

NOTE: Government CAGE code deliverables shall be delivered in native CAD, neutral format, and PDF format.

Delivery Format: Native CAD - any format native to the contractor's CAD system is acceptable, e.g. Catia®, or AutoCAD®, Inventor® (preferred), or Intergraph®, or Cadkey®, or Solidworks, or Pro/ENGINEER®, or SDRC I-DEAS®, or Mentor Graphics® and others.

AND

Neutral - Product Data Exchange using STEP (PDES)/Standard for the Exchange of Product model data per ISO 10303 Application Protocols (APs) 201 through 210 and 232.

AND

Portable Document Format (PDF) files

AutoCAD Systems and non-AutoCAD Systems Requirements:

(1) Do not mix paper and model space entities within the same drawing file.

(2) Special fonts used in the creation of drawings that are not part of the normal CAD system basic package and that are not proprietary or copyrighted shall be delivered with the digital data delivery. This is to enable the correct native CAD system viewing and a more complete translation of the original format and details of all delivered drawings.

(3) Digital drawings that are delivered shall have one drawing sheet per filename. This means that only one sheet number shall be placed on a drawing per filename. This also

means that a CAD file shall not have multiple layers containing different sheets of the same document (or drawing) number. Word processing documents of engineering drawings delivered in raster graphics formats shall have each page saved as a unique filename.

(4) Digital drawings from CAD systems that create sub-directories as part of their normal file creation process shall be delivered as a single file using the UNIX 'tar' format in order to preserve the original directory structure. A zip utility may be used for PC-based systems as long as options are employed to ensure integrity of the directory structure.

(5) Plot files created from other CAD systems shall use the same settings as the native files. Drawings created on a CAD system larger or smaller than a ratio of 1:1 when compared to standard drawing sizes (such as C size at 17" x 22"), shall be scaled to the standard drawing sizes (when measured across its length and width) whenever plot files are to be produced for delivery to the government.

(6) J-sized drawings (34" x 55"-176") shall have multiple plot files made with a minimum of a 10" inch overlap by choosing appropriate window option settings using E size dimensions (34" x 44"). The multiple plot files shall be listed with multiple frame numbers in the spreadsheet data in a separate column. Any other size drawings larger than E size (for example, K size, 40" x 55"-143") must have multiple E size plots created similarly to a J size drawing.

Three dimensional drawings, illustrations, and schematics, not intended for CAD applications, shall be delivered in digital 3-D vector format in accordance with the Extensible 3D (X3D) as defined in ISO/IEC 19775-1:2004, Extensible 3D (X3D)

c. *Mechanical Engineering Models:* Geometric representation of a physical detailed part, assembly, loft surface, or system in 3-dimensions created using CAD tools. Engineering models are used as a basis for Numerical Control (NC) Machining, Engineering Analysis, etc. Digital models that do contain the engineering drawings associated with the models in the same file, due to the characteristics of the CAD system being used, shall not have the model information visible when the drawing is viewed or printed. See Geometry Creation Requirements for 3D Models below:

Delivery Format: Native CAD - any format native to the contractor's CAD system is acceptable, e.g. Catia®, or AutoCAD®, Inventor® (preferred), or Intergraph®, or Cadkey®, or Solidworks, or Pro/ENGINEER®, or SDRC I-DEAS®, and others

AND

Neutral – PDES/STEP per ISO 10303, Application Protocols (APs) 201 through 210 and 232.

AND

Portable Document Format (PDF) files

d. *Machine Control Data:* Instruction statements to drive numerically controlled machine tools such as tube benders, milling machines, drilling machines, parts/devices insertion machines, photoplotters, lathes, etc. These files shall be post processed into machine specific instructions and represented using standards as follows (See paragraph 7 for detailed requirements for Printed Board Artwork Master and Drill Data Files.):

Delivery Format: Native Machine Language - Cincinnati Milicron®, or Teledyne Pines®, or Eaton Leonard®, Excellon®, or others.

AND

Neutral- Binary Cutter Locator (BCL), or Automatic Programmed Tool (APT), or Excellon®, or Gerber® (Standard RS-274 or Extended RS-274X)

e. *Electrical/Electronic Design Models and Associated Files*: This requirement includes product data files for electrical/electronic items, assemblies, and systems. These data files shall include source files (schematics and other design entry methodologies), compiled files, object files, design models (such as those used in logical circuit design, design simulation, and physical parts design), netlists (logical circuit and physical item designs), component placement and connectivity (conductor routing), physical layouts, programmable logic devices (PLDs) programming data, simulation files, test files, geometries (such as printed board description), and other product data files. (**Note**: See above paragraphs 4.a and b. for separate document and drawing requirements for the product definition data and paragraph 4 Note for the fileset encapsulation requirement.)

Delivery Format: Native files - Native CAD e.g., Cadence®, Mentor Graphics®, Racal-Redac®, Intergraph®, ABEL®, CUPL®, VERIBEST®, Viewlogic®, or others.

AND

Neutral - e.g., Electronic Design Interchange Format (EDIF), IPC-D-35x Series (D350, D356, etc.), VHDL (VHSIC Hardware Description Language) (IEEE Std 1 076), GDS II® Stream, Berkeley's OPEN-PLA® (Programmable Logic Array), JEDEC Standard (EIA JESD3), State Diagrams, Berkeley's SPICE®, STEP (STandard for the Exchange of Product model data) (ISO 10303), etc

5. Metadata Spreadsheet: A spreadsheet table structure that covers only the data to be delivered is required for each delivery. The Metadata Spreadsheet shall be delivered in Microsoft Excel digital format. If the Metadata Spreadsheet cannot be delivered using Microsoft Excel, the following may be substituted upon approval from the requesting office, identified in block 6 of the DD Form 1423: Native format or ASCII. **NOTE:** The header information from this spreadsheet is used along with the delivered digital data files to load data into the Digital Data Repository.

Content: The Metadata Spreadsheet shall contain a listing of all engineering documentation contained in the shipment.

Structure: Each row in the spreadsheet shall represent a distinct sheet number, unless covered by the exceptions below. All fields are left justified, except Sheet Number, Number of Sheets, Frame Number of a document number, Number of Frames, Revision Letter and Accompanying Document Revision (see definitions below). The data field titles shall be included at the top of the spreadsheet on row 1 only of the delivered spreadsheet. PIN and PIN revision fields shall be filled for all design model and engineering data files that do not include borders and drawing blocks. For spreadsheets delivered that exceed one thousand rows, the spreadsheet shall be divided into separate spreadsheet files on the delivered media. This division of spreadsheets should not cause the referenced documents listing or the indentured levels set listing that applies to a certain document number to be divided into separate spreadsheets.

Exception 1: For *word processing documents*, enter one row for each submission of the native document number delivered. The filename, document number, and all other applicable columns shall be filled.

Exception 2: For design model and engineering data files that do not include borders and drawing blocks, the sheet number is not applicable.

The fields in the spreadsheet table structure shall be entered in sequence as follows:

<u>DATA FIELD</u>	<u>FIXED FIELD LENGTH</u>
Filename (<i>including extension & special characters</i>)	24 characters
Document Title	40 characters
Prime Contractor	32 characters
CAGE	05 characters
Drawing Sheet Size	01 character
Sheet Number	04 characters
Number of sheets	04 characters
Distribution Code	01 character
System Model	15 characters
Revision letter	02 characters
Basic/Revision Date (DD-MMM-YYYY)	11 characters
SW_Name	20 characters
SW_Vendor Name	32 characters
SW_Version	10 characters
SW_Operating System	30 characters
SW_Operating System Version	10 characters
File_Type	20 characters
File_Format (with applicable version)	32 characters
Data rights	01 character
Document Number	32 characters
Frame Number	04 characters
Number of Frames	04 characters
Control Activity	02 characters
Accompanying Document Kind	02 characters
Accompanying Document Number	32 characters
Accompanying Document Revision	02 characters
Security Level	01 character
Media Number	02 characters

For Model and engineering data files that do not include drawing borders and drawing blocks, the Metadata Spreadsheet shall adhere to the following requirements. The document number and part or identifying number (PIN) shall be listed for use in indexing and traceability. These numbers shall reflect the closest document and P/N that is associated with or linked to the model or engineering data file.

Use all of the above spreadsheet data fields except for the following fields:

- Sheet Number
- Number of Sheets
- Frame Number
- Number of Frames
- Accompanying Document Kind

Accompanying Document Number
Accompanying Document Revision

-and add the following spreadsheet data fields:

<u>DATA FIELD</u>	<u>FIXED FIELD LENGTH</u>
Part or Identifying Number (PIN)	32 characters
PIN Revision letter	02 characters

Definitions:

Filename - Specify a file naming convention that provides up to 20 character unique file names. File extensions of up to 3 characters are used to discriminate file types. If DOS files must be accommodated, use a file naming convention of up to only 8 characters. List all file types to be delivered.

Document Title - Enter document title using text that is the complete descriptive name or title of an item or document.

Prime Contractor - Enter the name of the Prime Contractor.

CAGE - Enter the CAGE Code currently assigned to the Prime Contractor).

Drawing Sheet Size - Enter the character that identifies the drawing size of the document identified in this record.

Sheet Number - The individual sheet number of a multiple page document or drawing. Enter the number of the sheet (right justified with leading zeros) associated with the document number identified in this record. If the total number of sheets exceeds 9999, contact the requiring office identified in block 6 of the DD Form 1423 for which calls out this requirement.

Number of Sheets - A number that identifies the total count of sheets or pages in a document. Enter the total number of sheets contained in the document identified in this record. If the total number of sheets exceeds 9999, contact the requiring office identified in block 6 of the DD Form 1423, which calls out this requirement.

Distribution Code - Enter the distribution statement code letter (A, B, C, D, E, F, or X) of the document identified in this record. This code letter in the spreadsheet corresponds with the same code letter used in the distribution statement paragraph that appears on the drawing (for each sheet number).

System Model Number - Enter if this file is unique to a system model. For example, enter CCTT 71-02, AH-64 CMS 01-137, 01-144, etc., if the file applies to one of these systems. Leave blank if the file does not apply to a single designated system.

Revision Letter - The revision level assigned to a document or a specific sheet of a released document. Enter revision letter(s) applicable to the document number and specifically as applicable to each sheet number. A one-character entry will be alpha, right justified, with blank padding. For initial issue documents, the entry shall be blank.

Basic/Revision Date - The date when the document was approved for initial (original) release, or the date the revision of a document was approved. The latest date of the document (either the date of the basic approval or the date of the revision, whichever is later) shall be used. (EXAMPLE 26 MAR 2002)

SW Name - Enter the name of the native software CAD program used to generate the vector file.

SW Vendor Name – Enter the vendor of the native CAD software program.

SW Version – Enter the version number and/or letters of the native software CAD program used to generate the file.

SW Operating System - Enter the computer operating system for the CAD software.

SW Operating System Version - Enter the version of the computer operating system for the CAD software.

File Type - Enter the appropriate file type, i.e., vector, ASCII text, raster, firmware, Gerber, etc.

File Format - Enter the specific file format with version, i.e., RS-274X, DXF r14, EDIF 400 Schematic, Intel Hex-32, etc.

Data Rights- Enter the code which identifies the rights status of the information on the document or contained in the file identified by this record. All contractor, subcontractor, vendor, and supplier data shall have the rights status entered in this data field. The rights status codes are as follows:

a. "U" signifies that the Government has unlimited rights to use the document or file so coded.

b. "L" signifies that the Government has only limited rights to use the document or file so coded or has obtained Government Purpose License Rights (GPLR) to the data.

Document Number - An alphanumeric identifier located within the drawing number block that is unique and is the primary reference for a document. Enter the document number (drawing, list, specification, etc.) identified in this record, followed by blanks. If the number is an associated document and is prefixed with alphas i.e. PL, DL, identifying the document as a specific type of associated document, the prefix shall stay intact as part of the document number and not stripped off. The same practice shall apply to any suffixes to the document identifying number by the originating organization. For models and engineering data files that do not include drawing borders and drawing blocks, the document number shall be listed for use in indexing and traceability. This number shall reflect the closest document that is associated with or linked to the model or data file.

Frame Number - Enter the number of the frame, right justified with leading zeros. Entry will be 0001 for all files, with the following exception:

Number of Frames - Enter the total number of frames required for this sheet (right justified with leading zeros). Entry will be 0001 for all files, with the exception of the scenario discussed in frame number, above. For this exception:

Control Activity - Enter the applicable code, as follows:

<u>LOGISTICS ACTIVITY</u>	<u>CODE</u>
PEO STRI	PT

Accompanying Document Kind - When an accompanying document is delivered, enter the appropriate code from the following table. This is a required entry if a value is contained in the Accompanying Document Number column.

<u>Code</u>	<u>Document</u>
AD	Addendum
AM	Amendment
AN	Annex
AP	Appendix
AR	Article
AT	Attachment
EX	Exhibit
NT	Notice (safety, engineering, ECPs, ECOs, etc.)
SP	Specification (slash sheet or other similar types of associated specifications)
SU	Supplement
VR	Version
1N	Revision Notice

Accompanying Document Number - When an accompanying document identified is delivered, as shown in the Accompanying Document Kind table above, enter the accompanying document number, followed by blanks. This is a required entry if a value is contained in the Accompanying Document Kind column.

Accompanying Document Revision - When an accompanying document identified is delivered, as shown in the Accompanying Document Kind table above, enter the accompanying document revision letter (alpha). Right justified, with blank padding.

Security Level - Enter the code that identifies the classification of the digital data according to the following:

<u>Code</u>	<u>Classification</u>
N	Unclassified
C	Confidential
S	Secret
T	Top Secret

Media Number – Enter the consecutively numbered figure that matches the label number for each media type delivered.

Part or Identifying Number (PIN) – For models and engineering data files that do not include drawing borders and drawing blocks, an alphanumeric control number assigned

to identify a specific item. The PIN is an identifier assigned by the responsible design activity or by the controlling nationally recognized standard, which uniquely identifies (relative to that design activity) a specific item. The PIN generally includes the controlling drawing or document number and optional suffix. The PIN identifier shall meet the same structure requirements as those for the drawing number. The PIN does not include the drawing revision identifier, drawing size, or CAGE Code. If the file is not directly part of or an integral part of a PIN, then this number shall reflect the closest part or item that is associated with or linked to the model or data file. PINs are assigned to product data files (such as those for printed circuit board artwork and programmable logic devices (PLDs)), materials, parts, assemblies, equipment, accessories, and computer software.

PIN Revision Letter – The revision level assigned to a PIN. Enter revision letter(s) applicable to the PIN. A one-character entry will be alpha, right justified, with blank padding. For initial issue PINs, the entry shall be blank.

6. Indentured Data List (IDL): A spreadsheet table structure (separate from the metadata spreadsheet) representing the indentured level of the digital data delivery is required for each delivery. The IDL shall be delivered in Microsoft Excel format. If the IDL cannot be delivered using Microsoft Excel, native format or ASCII may be substituted upon obtaining approval from the requesting office identified in block 6 of the DD Form 1423.

Content: The IDL shall contain a listing of all engineering documentation related to the contract end item as developed, produced, and/or modified for this contract. The IDL shall include all reference documents, which are not part of the delivery, at the appropriate levels. The IDL shall include indenture levels that apply to the delivered document numbers.

Structure: All fields are left justified, except Revision Letter. The data field titles shall be included at the top of the spreadsheet on row one (1) only of the delivered spreadsheet.

The fields in the spreadsheet table structure shall be entered in sequence as follows:

<u>DATA FIELD</u>	<u>FIXED FIELD LENGTH</u>
Indenture Level	02 characters
Document Number	32 characters
Document Title	40 characters
Revision Letter	02 characters
Contract Number	24 characters

Definitions:

Indenture Level - Enter the indenture level applicable. The indenture level shall indicate the relationship of a document/drawing to the next, and shall be indicated by a two digit number. Begin with "00" for the system/top assembly drawing/document, increase by 1 ("01", "02", etc.) for each lower tier. Go down each "leg" of the tier until there is no lower drawing/document in that "leg". Go backwards up that same "leg", until finding a tier containing a second or subsequent unlisted drawing/document. Begin down this

new "leg" until there is no lower drawing/document. Repeat this process until all drawings/documents have been listed. Examples follow.

00 System/Top Assembly Drawing

01 Documentation and first subassembly drawing applicable to or referenced on 00 drawing

02 Documentation and first subassembly drawing applicable to or referenced on 01 drawing immediately above

03 Documentation and first subassembly drawing applicable to or referenced on 02 drawing immediately above

02 Next subassembly drawing applicable to or referenced on 01 drawing above

03 Documentation and first subassembly drawing applicable to or referenced on 02 drawing immediately above

03 Next subassembly drawing applicable to or referenced on last 02 drawing above

03 Next subassembly drawing applicable to or referenced on last 02 drawing above

04 Documentation and first subassembly drawing applicable to or referenced on 03 drawing immediately above

02 Next subassembly drawing applicable to or referenced on last 01 drawing above

03 Documentation and first subassembly drawing applicable to or referenced on 02 drawing immediately above

03 Next subassembly drawing applicable to or referenced on last 02 drawing above

01 Next subassembly drawing applicable to or referenced on 00 drawing above

02 Documentation and first subassembly drawing applicable to or referenced on 01 drawing immediately above

03 Documentation and first subassembly drawing applicable to or referenced on 02 drawing immediately above

Visual Example of Above.

00 System/Top Assembly Drawing - (A)

01 First Subassembly in A - (B)

02 First Subassembly in B - (C)

03 First Subassembly in C - (D)

02 Second Subassembly in B - (E)

03 First Subassembly in E - (F)

03 Second Subassembly in E - (G)

04 First Subassembly in G - (H)

02 Third Subassembly in B - (I)

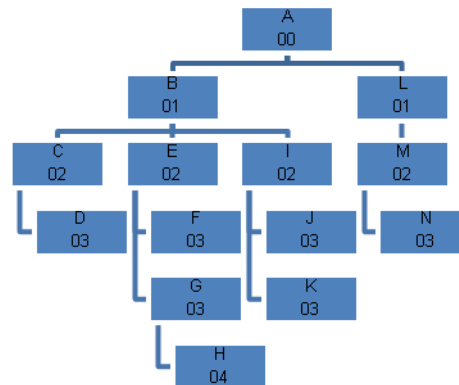
03 First Subassembly in I - (J)

03 Second Subassembly in I - (K)

01 Second Subassembly in A - (L)

02 First Subassembly in L - (M)

03 First Subassembly in M - (N)



Document Number - An alphanumeric identifier that is unique and is the primary reference for a document. Enter the document number (drawing, list, specification, etc.) identified in this record, followed by blanks.

Items listed in parentheses on documents are for reference only and shall not be recorded on the IDL. Drawing preparation documents and technical manuals shall not be included in the IDL.

Document Title - Enter document title. Use text that is the complete descriptive name or title of an item or document.

Revision Letter - The revision level assigned to a document or a specific sheet to a released document. Enter revision letter(s) applicable to the document number. A one-character entry will be alpha, right justified, with blank padding. For initial issue documents, the entry shall be blank.

7. Printed Board Artwork Master and Drill NC Data: Reference the paragraph 4d (Machine Control Data) for the product definition data type and paragraph 4 note for the fileset encapsulation requirement. View-only images of the master artwork shall be for use as reference data (see paragraph 4d). Printed Board Artwork Master per ASME Y14.24-1999 and IPC-D-275 shall be in Gerber format (Standard RS-274 or Extended Gerber RS-274X). The RS-274X format, if used, shall be in compliance with the current or subsequent later revision of the 'Gerber RS-274X Format User's Guide' (Part # 414-100-014 Rev D or later) by Gerber Systems Corp and shall not contain data that would restrict its usage as a neutral file for laser photoplotters. The content, format, and configuration control requirements for the printed board fileset shall be as follows:

a. A printed board fileset document shall be developed for each board fileset (see paragraph "g" below) to provide configuration control, content, and format information. This document shall be referenced on the master board drawing (ASME Y14.24-1999). As an alternative to this document, the printed board fileset information may be provided as an integral part of the printed board master drawing.

b. A unique printed board fileset part or identifying number (PIN), preferably the dash number or prefix of the above printed board fileset document or printed board master drawing, shall be assigned for each printed board fileset and referenced with revision on the printed board fileset document or master drawing. One board fileset shall be submitted for each printed board.

NOTE: The PIN shall be in compliance with its definition and requirements stated in paragraph 5.

c. The printed board fileset document shall meet the format and content requirements of ASME Y14.24-1999 and related contract drawing requirements and shall include the following information:

- (1) Board fileset PIN
- (2) Board fileset PIN Revision
- (3) Board Part Number
- (4) Master Drawing Document Number
- (5) The purpose of the Board fileset
- (6) Used on data (System(s))
- (7) Name of each file in the Board fileset

(8) Description of each file in the Board fileset (such as for silk screen, component layer, solder mask, etc.)

(9) Artwork image revision letter of each image produced by the image file

(10) Revision letter of each file, if any

(11) Date and time each file was last changed

(12) Size of each file in uncompressed form

(13) Polarity of each image (positive or negative)

(14) Instructions for composite layers, if any

(15) Gerber file format information:

(a) Gerber type (RS-274 or Extended RS-274X)

(b) Data units of measurement (inches, millimeters, etc.)

(c) Dimension word type (coordinate/absolute or incremental)

(d) Number of integer and decimal digits

(e) Zero suppression (leading, trailing, or none)

(f) Zero offset dimensions

(16) Native and/or neutral drill file format information:

(a) Drill file character set (such as EIA, ASCII, and EBCDIC)

(b) Native type with version (such as Excellon, Sieb & Meyer 3000, Trudrill, etc.)

(c) Neutral type with revision (such as Plain ASCII Text, ACL (ANSI/EIA 494), etc.)

(d) Data unit of measurement (inches, millimeters, etc.)

(e) Mode type (absolute or incremental)

(f) Unit scale factor

(g) Zero suppression type (leading, trailing, or none)

(h) Number of integer and decimal digits

(i) Drill rotation angle

(j) Drill x-y offset dimensions

(17) Identify the CAD system hardware platform, operating system with version, vendor of the printed circuit board (PCB) design software, and name of the PCB design software (with version) used to produce the Gerber and drill files.

(18) Identification of the target photoplotter model, manufacturer, type (laser, vector, etc.), and controller model, including any required special controller software configuration or processing packages, for the Gerber data, as applicable.

(19) Identification of the target NC drill machine and controller software with version for the native drill file.

(20) Special instruction, if any.

d. Delivery media containing board data files for more than one PCB shall contain a separate directory for each board or establish a file naming convention that would unambiguously distinguish the different board filesets.

e. Delivery media with compressed files shall also contain decompression software.

f. Delivery media shall be free of limited rights or shall be accompanied by documentation giving the Air Force unrestricted use of all files and software contained on the delivery media, as applicable.

g. Board fileset shall include the following files as a minimum:

(1) Aperture D-code table file(s) (see paragraph "h" below for details) (for Standard RS-274 files)

(2) Gerber Artwork image files (see paragraphs "i" and "j" for details)

(3) Native and/or neutral drill data files (see paragraph "k" for details)

h. Aperture D-code table file shall (for Standard RS-274 files):

(1) Record the date and time that the aperture file was last changed.

(2) Revision letter of aperture file

(3) Identify board part number

(4) State CAGE code

(5) Correlate aperture position numbers with D-code numbers

(6) Define D-code/aperture shapes using only standard shapes (which are standard circle, square, and rectangle). If custom shapes such as thermals, octagons, etc are used, they shall be defined with dimensioned illustrations to capture their true shapes and sizes. Also, the custom D-code macro file shall be provided.

(7) Column headings shall identify horizontal (width) and vertical (height) dimensions which correspond to "X" and "Y" coordinates, respectively, for proper orientation of shapes.

(8) State units of measurement (mils, millimeters, etc.)

i. The Gerber files shall be properly aligned and include the following Artwork images:

- (1) Circuit layers
- (2) Board outline
- (3) Silk screen of component reference designations
- (4) Silk screen of component's outlines as they appear on the PCB
- (5) Solder masks (Top and Bottom of board)
- (6) Plated and unplated drill holes.
- (7) Others, as applicable

j. Each of the above Gerber Artwork image files (paragraph "i") shall include the following information as a minimum:

- (1) Date and time the Artwork image was last changed
- (2) Board part number
- (3) Revision letter of Artwork image
- (4) CAGE Code
- (5) Layer order number and/or image name
- (6) Vertical and horizontal register marks with x-y coordinate dimensions and tolerances

k. The drill data fileset shall contain the following information:

- (1) Date and time the drill file(s) were last changed
- (2) Board part number
- (3) File revision
- (4) CAGE Code
- (5) File type (Excellon, Plain ASCII Text, etc.)
- (6) Drill tool sizes
- (7) Holes x-y coordinates
- (8) Drill tool (bit) used at each x-y location
- (9) Identify plated and unplated holes, if not identified on the master drawing

8. Software and Firmware Data: See the Electronic Design Data section (Paragraph 6e) for the delivery of programmable devices (such as PALs, PROMs, etc.) design and programming files. Software and firmware data reference shall be delivered as follows:

a. Software and Firmware data: Drawings defining software, such as instructions or data that will be or are intended to be resident in a memory device or other type of media, which becomes part of the end-item, shall be prepared as either a Software Installation Drawing or Altered Item Drawing to be determined by whether the software is one-time programmable or multi-programmable.

b. Memory device categories: For the purpose of this requirement, memory devices are categorized as being either one-time programmable or multi-programmable.

(1) One-time programmable memory devices shall be documented using the requirements of the Altered Item Drawing.

(2) Multi-programmable memory devices shall be documented using the requirements of the Software Installation Drawing.

c. Software installation drawing: A software installation drawing identifies the characteristics of the software, instructions for programming into the memory device, its master media and physical location. Software programs shall be identified by reference to PINs within the drawing form rather than identification by truth tables. This drawing type does not establish item identification.

d. Application: A software installation drawing is prepared when it is necessary to define the characteristics of the software, instructions for programming into a memory device, its master media and physical location.

e. Software installation drawing requirement. The drawing shall identify:

(1) Identification of the item to be programmed by referencing the original vendor's part number or by providing complete description of the item or by vendor item control drawing or source control drawing if a nationally recognized standard or Standardized Microcircuit Drawing (SMD) is not available. A SMD is a control drawing, and shall disclose the applicable configuration, envelope dimensions, mounting and mating dimensions, interface dimensional characteristics, specific performance requirements, nuclear effects, and inspection and acceptance test requirements for microcircuits in a military application per MIL-HDBK-780.

(2) PIN of the software, PIN revision letter, software version and other characteristics such as operating system and version, programming language used, source file identification and version, object file identification and version.

(3) Physical location of the master software or data: Name and address reference will be made or CAGE Code of the repository having custody of the master software programs or data required to program items.

(4) Detailed instructions needed to load software into an item.

(5) Acceptance requirements in the form of a test procedure or checksum.

f. Assemblies containing multi-programmable devices. Software or data that is programmed into a device at a higher level of assembly shall be documented using the software installation drawing requirements. The device shall not be re-identified due to programming or loading.

g. Altered item drawing (one-time programmable devices and multi-programmable devices used as one time programmable). Drawings describing the programmable requirements of a one-time programmable device shall be prepared as Altered Item Drawings. This type drawing shall be prepared only for those devices that are permanently altered prior to installation into a higher level of assembly.

h. Altered item drawing (one-time programmable devices and media) requirements. The requirements for Altered Item Drawings shall be in accordance with the requirements herein and the following:

(1) Identification of the item to be programmed by providing complete description of the item or by vendor item control drawing or source control drawing if a nationally recognized standard or SMD is not available.

(2) PIN of the software, PIN revision letter, software version and other characteristics such as operating system and version, programming language used, source file identification and version, object file identification and version.

(3) Physical location of the master software or data: Name and address reference will be made or CAGE Code of the repository having custody of the master software programs or data required to programs or data required to program items.

(4) Detailed instructions needed to load software into an item.

(5) Acceptance requirements in the form of a test procedure or checksum.

(6) Altered item identification marking requirements.

NOTE 1: The PIN shall be in compliance with its definition and requirements stated in paragraph 5.

NOTE 2: Reference the paragraph 4 note for the fileset encapsulation requirement.